

REMARKS

Claims 1-9 are pending.

Claims 1-7 have been amended to particularly point out and distinctly claim Applicants' invention.

Claims 8 and 9 have been added.

Objections to the Claims

The Examiner objects to Claims 1-7 on the ground of various informalities. These claims have been amended in the manner set forth in the Examiner's much appreciated suggestions. Accordingly, it is submitted that the objections to the claims have been overcome.

REJECTIONS UNDER 35 U.S.C. § 112, ¶2

The Examiner rejects Claims 1-7 on the ground of being indefinite. As to Claim 1, the Examiner states that "it being possible for ..." only indicates the possibility of "a metal end cap to be secured ..." and, therefore, is vague and indefinite.

Claim 1 has been amended to recite: "each cylindrical end face being structured to be secured in a vacuum-tight manner to a metal end cap to form a vacuum chamber". It is submitted that this refined recital is definite and passes muster under Section 112, second paragraph.

The Examiner states as to Claim 2 that it is not clear what is meant by "an angle of substantially at most 90°".

Claim 2 has been amended to recite an angle of substantially 90°, but not greater than 90°, with an inner surface of the ceramic tube. As set forth in the specification at page 2, lines 18-25, the cylindrical end face on an inner side of the ceramic tube forms an angle of substantially at most ninety degrees with an inner surface of the ceramic tube. "With an angle of less than ninety degrees (so that the cylindrical end face of the ceramic tube continues further towards the inner side of the vacuum circuit breaker along the metal of the end cap), the field strength is in theory reduced still further. ... An embodiment with an angle of ninety degrees is ... preferred" Hence, it is clear that the recited angle may be 90° or substantially 90°, but not greater than 90°.

Expressions such as "substantial" or "substantially" in patent claims have been recognized by the United States Supreme Court as sufficiently particular. The fact that "substantially" is a relative term does not inherently make the claim indefinite is well settled in the law. *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 US 45, 66 (1923);

Arnold Pipe Rentals Co. v. Engineering Enterprises, Inc., 146 USPQ 415, 421 (5th Cir. 1965); *Andrew Corp. v. Gabriel Electronics, Inc.*, 6 USPQ2d 2010, 2013 (Fed. Cir. 1998).

Hence, for the above reasons, it is submitted that Claim 2, as amended, is definite and passes muster under Section 112, second paragraph.

Claims 3-7 depend either directly or indirectly from Claim 1 and/or Claim 2. These claims are definite for the same reasons as were discussed above.

REJECTIONS UNDER 35 U.S.C. § 102(b)

The Examiner rejects Claims 1-7 on the ground of being anticipated by U.S. Patent No. 4,962,289 (Stegmüller), or U.S. Patent No. 4,445,016 (Sinnecker)¹, or DE 9205493U (Siemens AG).

Stegmüller discloses a switch chamber for a vacuum switch including a housing composed of a ceramic insulating tube. A relatively stiff cover 4 (Figure 2) results in high mechanical stress peaks at individual locations within ceramic tube 5 and at the solder connection between cover 4 and ceramic tube 5. A cover 14a (Figure 3) forms the connection between ceramic tube 5 and contact pin 3 by way of an inner portion in the form of a bellows-type cylinder 21. Cover 14a has an outer portion 14b made of a material having a low modulus of elasticity and a large plastic range (e.g., a copper free of gases). Although cover 14a is connected with ceramic tube 5 in the conventional manner by means of a hard solder, the selection of materials for the terminating cover and the intermediary provision of bellows-type cylinder 21 serve to substantially avoid the generation of dangerous shrinkage stresses in the ceramic material as well as the transfer of axially and laterally directed forces to ceramic tube 5. An elastic disc 28 (Figure 5) may be provided in a supporting member 9 to absorb mechanical shocks caused by the housing when it springs back.

In *Eibel Process*, Eibel's patent claimed an improved paper making machine. Eibel's improvement of existing machines was simple and minor in terms of structure. He merely elevated a part of the machine to add several degrees of pitch. However, the small change made a dramatic improvement in the efficiency of the machine. The defendant relied on prior machines that introduced some pitch for a different purpose. The Court stated that had the defendant "done so under unusual conditions, accidental results, not intended and not appreciated, do not constitute anticipation". *Eibel Process*, 261 U.S. at 66.

[P]rior accidental production of the same thing, when the character and function were not recognized until the invention of the later

¹ Numbered paragraphs 8 and 9 of the Office Action, as applied to Sinnecker, appear to be identical. Hence, these rejections are addressed one time in this Amendment.

patent, does not effect anticipation. [*Tilghman v. Proctor*, 102 U.S. 707, 711 (1881)] [A]nticipation is not disclosed by a drawing which incidentally shows a similar arrangement of parts, where such arrangement is not essential to the first invention and was not designed, adapted, and used to perform the function which it performs in the second invention, and where the first patent contains no suggestion of the way in which the result sought is accomplished by the second inventor. We think the defense of anticipation is not made out.

Munising Paper Co., Ltd. v. American Sulphite Pulp Co., 228 F. 700, 703, 704 (6th Cir. 1915) (footnotes and citations generally omitted).

Where the disclosure gives no indication that the drawings were drawn to scale, “it is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue.” *Hockerson-Halberstadt, Inc. v. Avia Group Int’l*, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000).

It is submitted that the drawings of the cited references must be evaluated for what they *reasonably* disclose and suggest to one of ordinary skill in the art.

Stegmüller does not teach or suggest any problem associated with an electrical field, much less, any concentration of electrical field at a triple junction of metal end cap, ceramic tube and vacuum chamber. Stegmüller does not teach or suggest the problem of the recited triple junction (see the present specification at page 1, line 29 through page 2, line 2) and the remedies to solve this problem. Stegmüller merely discloses a problem and an associated solution related to preventing relatively large mechanical stresses in a vacuum switch.

Sinnecker discloses (Figures 1 and 2) a vacuum switching tube 10 in the vicinity of its upper end which is connected to a head piece 7. A metal cap 26 is soldered to the upper annular end of a hollow ceramic insulator 25 at the upper end of the vacuum switching tube 10. A joint or seam 31 between the hollow insulator 25 and the metal cap 26 can be soldered so as to provide good vacuum tightness and good mechanical strength. Nevertheless, heavy mechanical stresses can weaken or damage the soldered seam 31, making the vacuum switching tube 10 leak and thereby rendering it unusable. Hence, the break-off force (*i.e.*, the force necessary to separate the soldered seam 31 when the lead bolt 11 is firmly clamped at its end), is increased by a shaped body 32 provided as a cap which has an upper conical part 33 extending approximately from the upper end of the hollow insulator 25 to the closing plate 27 and an adjoining cylindrical surface 34 which is

concentric with the hollow insulator 25. Sinnecker, thus, relates to the provisioning of a reinforcement at the outside of an end cap in order to strengthen the solder connection of ceramic tube and end cap.

Sinnecker does not teach or suggest any problem associated with an electrical field, much less, any concentration of electrical field at a triple junction of metal end cap, ceramic tube and vacuum chamber. Sinnecker does not teach or suggest the problem of the recited triple junction and the remedies to solve this problem. Sinnecker merely discloses a problem and an associated solution related to mechanically strengthening the solder connection of a ceramic tube and an end cap.

To the extent that Siemens AG (Figure 1) might show a ceramic tube 2 and an end cap 3, it is submitted that any straight edges of any such ceramic tube are not addressed in this reference and that the internal bevels thereof, which one of ordinary skill in the art would recognize to be present, are not shown for simplicity of illustration. See, for example, U.S. Patent No. 5,315,081 (assigned to Siemens AG) (a true and correct copy of which is attached hereto as Exhibit 1). Therein, it is stated at column 4, lines 34-39 (*emphasis added*), with respect to Figure 1 that:

The region of the insulator 3 protected against condensation can be enlarged in that the insulator 3 *is beveled* in the region of the edges, which causes the voltage withstand capability in this region to be increased and allows an application also in the medium-voltage range (<2000 V).

Siemens AG, thus, does not teach or suggest a cylindrical end face of a ceramic tube being shaped in such a manner that, in the assembled state, it makes contact with a metal end cap at least as far as the internal diameter of the ceramic tube in order to prevent, in operation of a vacuum circuit breaker, a concentration of electrical field at the triple junction of metal end cap, ceramic tube and vacuum chamber.

As to the three cited references, details sought by the Examiner from the corresponding drawings relating to the recited triple junction are not essential to the corresponding reference and were not designed, adapted and used to perform the function which it performs in the claimed invention. The cited references, which do not teach or suggest the problem of the recited triple junction and the remedies to solve this problem, contain no suggestion of the way in which the result sought is accomplished by the claimed invention. For a person skilled in the art, it is well known that ceramic tubes, which are used for vacuum switches, have beveled edges.

For example, Japanese Publication No. 09223440 (of record as Cite No. CC) addresses the issue of problems associated with the triple junction. This reference provides a very different solution, and the drawings clearly show beveled edges of the ceramic tube 1a, both at the inner edge and the outer edge.

For example, in German document DE 297 17 489 (of record as Cite No. AA), a vacuum tube 10 includes two end caps 15 and tube members 11,11'. Two specially shaped screens 2,2' are disposed between the ends of each of the tube members 11,11' and the corresponding end cap 15. Hence, the solution is found in the specially shaped screens 2, 2'. It is submitted that the straight edges of the tube members 11,11' are not addressed in this German document and that the bevels thereof, which one of ordinary skill in the art would recognize to be present, are not shown for simplicity of illustration.

For example, in German document DE 199 55 216 (of record as Cite No. DD), the part of the end caps 18,23 abutting the ceramic tube 11 are not discussed, unlike the parts of those end caps which extend from the ceramic tube. It is submitted that the straight edges of the ceramic tube 11 are not addressed in this German document and that the bevels thereof, which one of ordinary skill in the art would recognize to be present, are not shown for simplicity of illustration.

Here, unusual conditions exist as contemplated by *Eibel Process*. It is submitted that the "straight edges" of the ceramic tubes of the three cited references are not addressed in those documents and that the bevels thereof, which one of ordinary skill in the art would recognize to be present, are not shown for simplicity of illustration. As such, it is submitted that only through impermissible hindsight would one of ordinary skill arrive at the refined arrangement according to Claim 1.

In view of the above, it is submitted that the skilled artisan having knowledge of the prior art will find no motivation whatsoever in any of the references of record to provide the solution according to Claim 1 as now presented. Indeed, the skilled artisan would be motivated to provide any of the solutions offered in the mentioned prior art documents, which are different from the refined features as set forth in Claim 1. The references do not teach or suggest a structure to prevent, in operation of a vacuum circuit breaker, a concentration of electrical field at the recited triple junction of metal end cap, ceramic tube and vacuum chamber.

Claims 2-9 depend either directly or indirectly from Claim 1 and patentably distinguish over the references for at least the same reasons.

Furthermore, Claim 8 recites that the cylindrical end face on an inner side of the ceramic tube forms an angle of substantially 90°, but less than 90°, with an inner surface of the ceramic tube. See, for example, the specification at page 2, lines 20-23. It is submitted that the cited references do not teach or suggest this refined recital which further patentably distinguishes over the references.

Claim 9 depends from Claim 8 and patentably distinguishes over the references for at least the same reasons.

Summary and Conclusion

The prior art made of record and not relied upon but considered pertinent to Applicants' disclosure has been reviewed.

U.S. Patent No. 6,864,456 (Banghard et al.) discloses (Figure 1) construction of a vacuum switching chamber including a plate-like power current connection 1 and a first annular insulator 4. In the left-hand part of the illustration, a tubular part 3 is provided as the wall part, whose ends are soldered firstly to the metallic plate 1 and secondly to a portion of one end surface in the annular insulator 4. In the right-hand part of the illustration, the wall part 31 is formed integrally with a shield 32 and is slightly corrugated in the transitional region from the wall part to the shield. The insulating ring 41 has a cross section including bevels.

U.S. Patent No. 4,216,360 (Cherry et al.) discloses (Figure 1) a vacuum switch 10 comprising an annular insulating ring body portion 12 and a pair of flexible annular corrugated diaphragm members 16a, 16b which are sealed to and extend between part of the insulator body 12 and respective cylindrical contacts 14a, 14b. An annular supporting member 24 is supported from the insulating body member 12.

In summary, it is submitted that Claims 1-9 are patentable over the references of record.

Reconsideration and early allowance are requested.

Respectfully submitted,



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